

# **An Evaluation of Preliminary Performance Measures for Prefabricated Submerged Concrete Breakwaters: Section 227 Cape May Point NJ Demonstration Project**

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## **Introduction**

The National Shoreline Erosion Control Development and Demonstration Program of the U.S. Army Corps of Engineers was established by Section 227 of the U.S. Water Resources and Development Act (WRDA) of 1996. The purpose of the program is to develop innovative methods or approaches for reducing shoreline erosion. Cape May Point, New Jersey was selected as the initial site for the Demonstration Program with the purpose of evaluating the functional, structural and economic performance of the Beachsaver Reef™ prefabricated concrete breakwater compared to a less expensive type of prefabricated concrete structure called a Double-T sill.

## **Background**

Cape May Point is a 1.66 km beachfront community located on the southern tip of New Jersey in Cape May County. The shoreline at Cape May Point is vulnerable to beach erosion and storm damage due to exposure to waves from both the Atlantic Ocean and Delaware Bay. Along with waves, a marginal flood channel to the entrance to Delaware Bay runs parallel to the shoreline some 180 m off the beach. Strong ebb and flood currents (measured maximum of 2 m/s) transport sand eroded from the beach by waves either into the bay or out into the Atlantic Ocean.

With a history of beach erosion, the site has several pre-existing shore protection structures, including a series of nine groins at ~150-250 m spacing creating eight groin compartments and rubble revetment armoring the shoreline in groin cell 1. Cell 2 and cell 3 were part of the State of New Jersey Pilot Reef Project (Bruno *et al.*, 1996), where Beachsaver Reefs™ were installed in the summer of 1994 across both groin compartments at their seaward end.

## **Project Features**

To mitigate future storm damage and coastal erosion at Cape May Point, an additional Beachsaver Reef™ was installed in cell 5 and an inverted Double-T sill structure was installed in cell 6. Both structures extend between the seaward tips of the groins to enclose the respective groin cells in a perched beach configuration to augment the sand retention capability within the groin cell.

The Beachsaver Reef™ in cell 5 installed in September 2002 was similar to the existing reefs in cells 2 and 3 with the exception that a new foundation treatment was used to reduce scour on the landward side of the reef. The reef also was placed slightly higher in the water column with the crest located approximately at Mean Low Water (MLW). The Double-T sill is a relatively low-cost, pre-cast concrete structure that is commonly used for the construction of parking garages and bridges. The Double-T sill was installed in October 2002 in an inverted position (upside down  $\perp\perp$  position) such that the crest of the stems was approximately 0.9 m above the elevation of the seabed.

## **Measures of Performance**

Measures of performance focus on quantifying functional (sand retention), economic (reduction of sand fill requirements) and structural stability (settlement and scour) of the breakwater structures. A series of measurement parameters were developed prior to structure placement to provide an objective basis for evaluating each area of performance. Analysis of monitoring data and evaluation techniques will be presented to assess the performance criteria of each structure as a viable shore protection alternative in an area of wave and current interaction. The purpose of evaluating the functional and economic performance of this demonstration project is to assess the effectiveness of using these different types of shore protection structures to enhance the retention of a federal beachfill project constructed in December 2004 and to lengthen the renourishment interval.